AD-A193 938 DEVICE FOR MAKING TUBES OUT OF FIBERGLASS(U) FOREIGN 1/1
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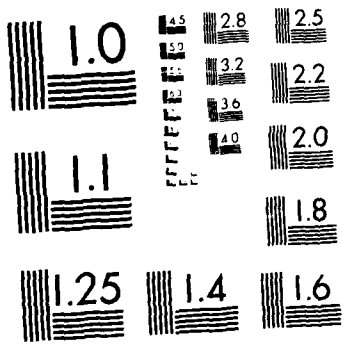
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FOREIGN TECHNOLOGY DIVISION

DEVICE FOR MAKING TUBES OUT OF FIBERGLASS

by

J.L. Grosh

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HUMAN TRANSLATION

FTD-ID(RS)T-0459-88 17 June 1988

MICROFICHE NR: FTD-88-C-000493L

DEVICE FOR MAKING TUBES OUT OF FIBERGLASS

By: J.L. Grosh

English pages: 6

Source: USSR Patent Nr. 365879, 8 January 1973, pp. 1-3

Country of origin: USSR
Translated by: Charles T. Ostertag, Jr.
Requester: FTD/TQTR
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U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

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DEVICE FOR MAKING TUBES OUT OF FIBERGLASS

Russian Patent No 365879

Author of Invention: James Luther Grosh (USA)

Applicant: "United Aircraft Corporation" (USA)

A device is known for making tubes out of fiberglass by means of winding tape made from fiberglasses impregnated with binding composition onto a mandrel with the simultaneous addition of particles of a solid friable material between the neighboring turns with subsequent hardening of the binder.

The proposed device differs from the known device due to the fact that for the purpose of improving the resistance of the items to external mechanical loads on the stage of interlayering between the turns a sand of nonuniform granulometric composition is used. Initially large particles of sand 1.2-2.4 mm in size are applied, then finer particles 0.005-0.15 mm in size, locating them uniformly between the large particles.

Simultaneously with the sand pieces of fiberglass are fed between the turns of the tube being formed.

It would be desireable that after hardening of the resin the structure of the tube would contain a considerable amount of fibrous

material for withstanding internal loads and a sufficient amount of friable material between the fiber layers for resisting compression and longitudinal loads. However, due to the indicated limitations on the comparative thickness of the corresponding layers in certain cases, when extremely high external compressing loads develop, there must be the possibility of including a somewhat greater amount of friable material than is required for resistance to internal pressures.

Thanks to its high strength, chemical and physical properties, and also acceptable cost, fiberglass can be considered as the most preferable material. However, it is possible to use other high-strength fibers, as an example - metal wires or fibers and other materials, fibrous silicon oxide for example. Single-thickness or spliced fibers can be used.

Sand is the preferable material. However, many other materials can be used, for example, silicon oxide in a friable form, fine hollow balls of different materials, carbon (coal) and graphite. If, for example, a light-weight pipeline is required, then vermiculite or fine hollow balls, different materials, such as glass or phenol resin are preferable materials.

In the fabrication of plastic constructions it is possible to use different binding systems, the most preferable are epoxy or polystyrene systems.

Figure 1 depicts the layout for making the tube, and Figure 2 - a

cross section of a wall of the tube enlarged.

Mandrel 1, adapted for rotating in the direction indicated by the arrow, is wound with tape 2 made from fibers 3, which are wetted with resin during passage through vat 4 and across the continuous operating rollers 5. The fibers are wound continuously on the mandrel along its length thanks to the relative back and forth movement along the axis of the mandrel during its rotation. The spacing of the winding can be regulated by known technical methods, the appropriate selection of the rate of rotation of the mandrel and the rate of longitudinal shifting. It is preferable to use the fibrous tape 2 with a very high angle of winding so that the fibers, which are situated without a break over the ring, form lap windings. The device has a hopper 6 which is located above the mandrel 1 at the site where the tape 2 comes in contact with the mandrel. The hopper consists of two separate discharging sections 7 and 8, each of which has an independent feeder. The discharging section 7 is located in front of discharging section 8, and on the drawing the space between them has been exaggerated for a clearer representation of the layout which is being depicted in Fig. 1. The discharging sections are located vertically above the site of contact of tape 2 with the mandrel in such a manner that the particles of friable material, being supplied from discharging section 7, fall on the tape first during rotation of the mandrel, and the particles from section 8 are placed on top of them. There is a sufficient amount of resin on the tape so that the particles of friable material adhere to it. The particles in feeder 9 are larger than those in feeder 10 so that the larger particles are laid on the tape first, and the smaller

ones are placed on top of the larger ones and between them.

This process continues for a period of several pases for obtaining a wall of the required thickness, after which vulcanization is carried out, then the mandrel is extracted. By using the proposed method a higher uniformity of the thickness of the layer of sand is obtained, and a higher density than in the case of using particles of random dimensions or of only one size. When particles of random sizes are used a wall of nonuniform thickness is obtained. When particles of the same size are used the thickness of the wall can be regulated, however the density of the layer obtained is not sufficient. Thanks to the proposed process the larger particles are laid on the tape first, creating a layer which is uniform in thickness, and the smaller particles fill the gaps between the larger ones, improving the density without increasing the layers of friable material.

The particle sizes can be selected in quite wide limits. Tubes with the desired characteristics are obtained by using large particles with dimensions from 2.38 to 1.19 mm, and smaller with the limits of from 0.149 to 0.005 mm.

Figure 2 shows the cross section of the wall of a tube which has been made according to the invention. The inner layer 11 is a gel coating which contains a veil fabric 12, which was first turned on a mandrel which was coated with rubber. For assuring longitudinal reinforcement the fibers 13 are located above the veil fabric and along the length of it. The layers of fibers 14 located over the ring are

separated by layers of friable material 15, each of which contains large 16 and small 17 particles. The thickness of the layers of friable materials is determined in essence by the large particles. The entire construction is held together with the help of a vulcanized rubber shell.

Example. A tube with an inner diameter of 61 cm and outer diameter of 62.9 cm is made by the proposed method using fiberglass and sand, the grains of which have average dimensions of 1.19 and 0.074 mm. The layers of fiberglass have a thickness of 0.0127 cm and the layers of friable materials have a thickness of around 0.127 cm. In the final form the tube contains the following amount of components, %: resin 35, glass 15 and sand 50, with approximately 10% of fine sand in weight units.

Invention Claim

1. A method of making tubes out of fiberglass by means of winding tape from fiberglass which is impregnated with a binder composition with the simultaneous addition of particles of a solid friable material between the adjacent turns with subsequent hardening of the binder and removal of the tube from the mandrel, **characterized by the fact that** for the purpose of increasing the resistance of parts to external mechanical loads sand with a nonuniform granulometric composition is introduced between the adjacent turns of the tube on the stage of its shaping. Initially the large particles 1.2-2.4 mm in size are laid on, and then the smaller particles 0.0005-0.15 mm, locating them uniformly

between the large particles.

2. Method in point 1, **characterized by the fact that** between the turns of the tube being formed pieces of fiberglass are supplied simultaneously with the sand.

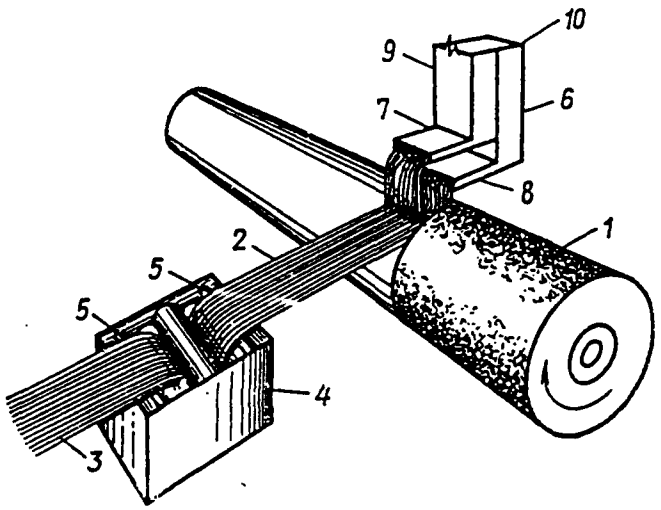

Figure 1.

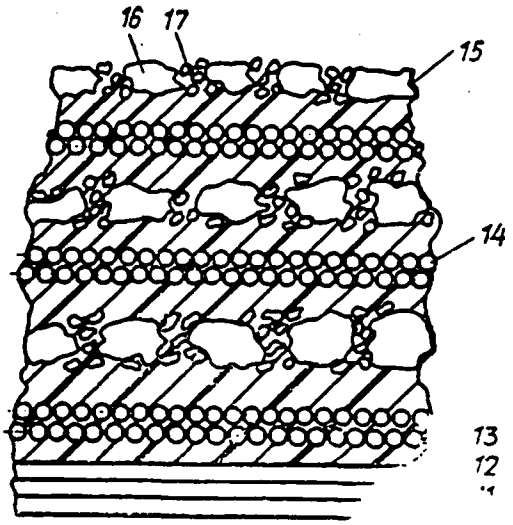

Figure 2.

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